Worksheet - Factors, multiples, primes, squares and cubes

Year: Year 5 · 20

Show your working.

Question 1

Question 1 – Listing factors *(Section A · Practice)*

List all the factors of each number. Write them in order.

a. 24
b. 30
c. 45

Question 2

Question 2 – Factor pairs *(Section A · Practice)*

Write all the factor pairs of 36 and of 48. Say which number has an odd number of factors.

a. 36
b. 48

Question 3

Question 3 – Multiples *(Section A · Practice)*

Write the first six multiples of each number.

a. 7
b. 12

Then answer: (c) Is 84 a multiple of 7? (d) Is 100 a multiple of 12?

Question 4

Question 4 – Prime or composite? *(Section A · Practice)*

Write prime or composite for each number. For composite numbers, write a factor other than 1 and the number.

a. 17
b. 21
c. 29

d. 51
e. 57
f. 91

Question 5

Question 5 – Squares and cubes *(Section A · Practice)*

Work out each answer.

a. 7^2
b. 3^3
c. 12^2
d. 5^3
e. 10^3

(f) Is 81 a square number, a cube number or both?

Question 6

Question 6 – Common factors and multiples *(Section A · Practice)*

(a) List the common factors of 18 and 30 and find their highest common factor. (b) Find the lowest common multiple of 4 and 6. (c) Find the lowest common multiple of 5 and 8.

Question 7

Question 7 – Teams for the football morning *(Section B · Real-life practice)*

Year 5 has 36 children. For the football morning the teacher wants to put them into equal teams with no children left over.

a. List the different team sizes she can choose. (Use the factors of 36.)
b. She wants teams with at least 5 children but no more than 12. Which team sizes work?
c. If there are 9 children in each team, how many teams are there?
d. Two more children join the class. Now there are 38 children. Can she still make equal teams of 6? Explain.

Question 8

Question 8 – Square tiles in the hall *(Section B · Real-life practice)*

The new school hall floor is made of square tiles. The builder lays them in a square pattern. A small square floor in the entrance hall uses 49 tiles and the big hall uses 144 tiles.

a. How many tiles are in each row of the entrance hall?

b. How many tiles are in each row of the big hall?
c. How many more tiles are in the big hall than in the entrance hall?
d. The builder says that a square floor with 50 tiles is not possible. Explain why he is right.

Question 9

Question 9 – The bus stop *(Section B · Real-life practice)*

Two buses leave the town centre at 9:00 am. The number 12 bus leaves every 6 minutes and the number 15 bus leaves every 8 minutes.

a. Write the times of the next four number 12 buses after 9:00 am.
b. Write the times of the next three number 15 buses.
c. At what time will both buses leave together again?
d. How many minutes is that after 9:00 am?

Question 10

Question 10 – Sharing sweets *(Section B · Real-life practice)*

Jaz has 48 sweets and wants to put them in identical bags with the same number of sweets in each bag. All the sweets must be used.

a. How many different ways can she do this? List the number of bags and the sweets in each.
b. She wants each bag to have more than 5 but fewer than 15 sweets. Which choices are possible?
c. She buys 12 more sweets. Now she has 60 sweets. Can she make 7 bags? Explain.
d. Which is a prime number of bags she can use with 60 sweets?

Question 11

Question 11 – Building with cubes *(Section B · Real-life practice)*

Ravi builds big cubes out of small wooden cubes. His first cube is 2 by 2 by 2, the second is 3 by 3 by 3 and the third is 4 by 4 by 4.

Big cube	Small cubes
2 by 2 by 2	?
3 by 3 by 3	?
4 by 4 by 4	?
5 by 5 by 5	?

a. Complete the table.
b. How many more small cubes are in the 4 by 4 by 4 cube than in the 3 by 3 by 3

cube?
c. What do you call the numbers in the second column?
d. Does Ravi have enough with 100 small cubes to build the 5 by 5 by 5 cube?

Question 12

Question 12 – Lockers and primes *(Section B · Real-life practice)*

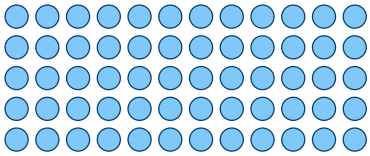
The 30 lockers in the gym are numbered from 1 to 30. Otto paints the number of each locker red if the number is prime.

a. Write the numbers of the lockers that are painted red.
b. How many are painted red?
c. Are any of the red lockers even-numbered? Which one?
d. Otto paints green all the multiples of 6. List them.
e. Is there a locker that is both red and green? Explain.

Question 13

Question 13 – Plants in the garden *(Section B · Real-life practice)*

Mum has 60 vegetable plants to put into a rectangular bed with equal rows.



a. The picture shows 5 rows of 12. Write the multiplication fact it shows.
b. List all the ways of arranging 60 plants in equal rows. (Use factor pairs.)
c. Which arrangement is closest to a square?
d. Mum buys 4 more plants. Is 64 a square number? What arrangement would that make?

Question 14

Question 14 – The clapping game *(Section B · Real-life practice)*

At the birthday party of Sam the children play a counting game. They count from 1 to 50. Everyone claps on every multiple of 4 and stamps on every multiple of 6.

a. List the numbers on which the children clap.
b. List the numbers on which they stamp.
c. On which numbers do they clap and stamp together?
d. What is the lowest common multiple of 4 and 6, and how does it help with part (c)?

Question 15

Question 15 – The two lighthouses *(Section C · Problem solving)*

Two lighthouses flash their lights across the sea. Lighthouse A flashes every 12 seconds and lighthouse B flashes every 18 seconds. They flash together at midnight exactly.

a. Write the first four multiples of 12 and of 18.
b. After how many seconds do they next flash together?
c. How many times do they flash together in the first 5 minutes after midnight (not counting midnight)?
d. A third lighthouse C flashes every 9 seconds. Does it flash at the same time as A and B at midnight and again after the same time? Explain.
e. At what time (to the nearest second after midnight) do A and B flash together for the third time after midnight?

Question 16

Question 16 – Number detective *(Section C · Problem solving)*

Detective Otto is searching for a mystery number. Here are the clues:

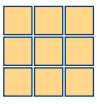
- It is between 40 and 80.
- It is a multiple of 9.
- It is not a square number.
- It is a multiple of 4.

a. List all the multiples of 9 between 40 and 80.
b. Which of these numbers are square numbers? Cross them out and say which remain.
c. Which of the remaining numbers is a multiple of 4? That is the mystery number.
d. Write the mystery number as a product of prime factors.
e. Is the mystery number a factor of 144? Explain.

Question 17

Question 17 – Square patterns *(Section C · Problem solving)*

Mia makes patterns of square tiles. Pattern 1 has 1 tile, pattern 2 has 4 tiles, pattern 3 has 9 tiles and pattern 4 has 16 tiles.



a. How many tiles are in pattern 5 and pattern 10?
b. How many extra tiles are added from pattern 4 to pattern 5? And from pattern 5 to pattern 6?
c. Write the sequence of extra tiles from pattern 1 to 6. What do you notice?
d. Mia has 200 tiles. What is the biggest square pattern she can make? How many

tiles are left over?
e. Is it possible to make a square pattern with exactly 150 tiles? Explain.

Question 18

Question 18 – Prime sums and prime factors *(Section C · Problem solving)*

Goldbach noticed that even numbers bigger than 2 seem to be the sum of two prime numbers. For example 10 = 3 + 7 = 5 + 5.

a. Write 20 as the sum of two primes in two different ways.
b. Write 30 as the sum of two primes in three different ways.
c. Draw a factor tree for 90 and write it as a product of primes.
d. Find the number whose prime factors are $2 \times 2 \times 5 \times 7$.
e. Show that 91 is composite although it is not divisible by 2, 3 or 5.

Question 19

Question 19 – The painted cube *(Section C · Problem solving)*

Tom builds a 3 by 3 by 3 cube from 27 small white cubes and then paints the whole outside red. He lets the paint dry and takes the big cube apart.

a. How many small cubes are in the big cube? Why is this number a cube number?
b. How many small cubes have 3 red faces? (Think about the corners.)
c. How many have exactly 2 red faces? (Think about the edges.)
d. How many have exactly 1 red face and how many have no red face?
e. Add your four answers. Check that the total is 27.

Question 20

Question 20 – Challenge: twelve factors *(Section D · Challenge)*

Alex says: "I am thinking of a number with exactly 12 factors."

a. Show that 60 has exactly 12 factors by listing them.
b. The number could also be 72. List the factors of 72 and count them.
c. Find the smallest number with exactly 6 factors, and explain how you checked.
d. Show that 24, 36 and 48 do not have exactly 12 factors. Which number is the smallest with exactly 12 factors?